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RSPA-W-7421-10

Additional Inform.

CONNECTICUT YANKEE ATOMIC POWER COMPANY

E12468

HADDAM NECK PLANT
362 INJUN HOLLOW ROAD • EAST HAMPTON, CT 06424-3099

August 29, 2003
CY-03-094

Ref. 49CFR107 & 49CFR173
Exemption No. 12468

Associate Administrator for Hazardous Materials Safety
Research and Special Programs Administration
Attention: Exemptions, DHM-31
400 7th Street, SW
Washington, D.C. 20590-0001

Technical Bases Summary.

Haddam Neck Plant
Request for Modification of Exemption for the
Shipment of Reactor Pressure Vessel

In our previous letter of June 12, 2002, Connecticut Yankee Atomic Power Company (CYAPCO) requested a modification of DOT Exemption DOT-E 12468, issued on November 17, 2000, that: a) provided exemption from specific regulations for the shipment of the Haddam Neck Plant (HNP) reactor pressure vessel (RPV) within a Reactor Vessel Transport System (RVTS) from the HNP site to the low-level radioactive waste burial site at Barnwell, South Carolina; and b) allowed the shipment of the RVTS as an IP-2 package containing the RPV and its internals that are classified as LSA-III. The modified exemption (DOT-E 12468, First Revision) was subsequently issued by the U.S. DOT on July 10, 2002.

Pursuant to 49 CFR § 107.105, this letter requests a modification to DOT Exemption No. 12468, First Revision, to reflect: (a) additional changes in the configuration of the RVTS and associated technical data, (b) changes in project management and RPV transport-related responsibilities, and (c) changes in the projected date of shipment and the expiration date of the exemption certificate. The changes in the following enclosures are bolded and side-barred to facilitate staff review. All other aspects of DOT Exemption No. 12468, First Revision, remain the same.

This request for exemption modification is supported by the following enclosures:

Enclosure 1 - (Revised Compliance Matrix) – This document is a revision to the revised Compliance Matrix that comprised Enclosure 1 of CYAPCO's request for modification of exemption, dated June 12, 2002.

In general, the differences from the previously approved compliance matrix are:

- Changes in project management, transportation responsibilities and shipment date
- The center section of the ALARA shield plate was left out
- Foam rubber slugs will be/were injected after each lift of grout to clear the grout between the injection pump discharge and grout lance
- The exterior surface of the reactor vessel will only be decontaminated if required to meet the LSA III requirements of 49 CFR 173

Enclosure 2 - (Revised Addendum to Transport System Description Report/TSDR) – This document is a revision to the TSDR Addendum that comprised Enclosure 2 of CYAPCO's request for modification of exemption, dated June 12, 2002.

In general, the differences from the previously approved TSDR are:

- The hold down spring has been segmented and placed on the ALARA shield
- Twelve inches of structural grout was used at the top of the canister versus six inches
- The center section of the ALARA shield plate was left out
- Foam rubber slugs will be/were injected after each lift of grout to clear the grout between the injection pump discharge and grout lance
- Figure 5 was revised showing the typical barge transport configuration

Enclosure 3 - (Revised Transportation and Emergency Response Plan) – This document is a revision to the Plan that comprised Attachment 4 to CYAPCO's original request for an exemption, dated March 30, 2000.

In general, the differences from the previously approved plan are:

- To reflect the termination of the Bechtel contract, and the decision of CYAPCO to self-perform the work
- To update the references to include additional CYAPCO, Bigge, and regulatory references
- To denote that a CYAPCO Health Physics Technician (HPT) will be responsible for providing health physics surveillance during transportation of the Canister and for responding to radiological emergencies. The CYAPCO HPT will maintain the principles of ALARA and radiological controls in accordance with industry practices
- To clarify the references to the various tugboats
- To denote that Bigge will be required to obtain approval from the U.S. Coast Guard to use the Savannah River Site boat ramp
- To require the HPT to conduct a shipment radiation and contamination survey of the prime mover and Canister
- To update the Emergency Notification List

The Reactor Vessel and Internals Characterization Report (comprised of Attachment 3 to the original exemption application submitted on March 30, 2000, and Enclosure 3 to the first exemption modification application submitted on June 12, 2002) is unchanged.

The current project schedule indicates the shipment of the RPV will occur on or before November 18, 2003. Accordingly, the need date for the modified exemption being requested is October 1, 2003, in order to support pre-shipment preparation activities that need to be implemented.

Should you have any questions regarding this request, or need any additional information, please contact Mr. G. P. van Noordennen, Manager of Regulatory Affairs, at (860) 267-3938.

Sincerely,

Gerard van Noordennen for

Noah Fetherston
Site Manager

Enclosures:

Enclosure 1 – Revised Compliance Matrix
Enclosure 2 – Revised Addendum to Transport System Description Report (TSDR)
Enclosure 3 – Revised Transportation and Emergency Response Plan

cc: R. Boyle, Office of Hazardous Materials Technology, US DOT
Document Center, US DOT (2 copies)
T. B. Smith, NRC Project Manager
E. L. Wilds, Jr., Director, CT DEP Monitoring and Radiation Division
Document Control Desk, US NRC

ENCLOSURE 1

REVISED COMPLIANCE MATRIX*

HADDAM NECK PLANT

REACTOR PRESSURE VESSEL

AUGUST 2003

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* This is a revision to the Revised Compliance Matrix that comprised Enclosure 1 of CYAPCO's request for modification of exemption, dated June 12, 2002.

ENCLOSURE I

REVISED COMPLIANCE MATRIX

EXEMPTION REQUEST FROM THE PACKAGING REQUIREMENTS OF 49 CFR 173 FOR THE SHIPMENT OF THE HADDAM NECK PLANT (HNP) REACTOR VESSEL TRANSPORT SYSTEM

For ease of review and processing, this exemption request was prepared under the guidelines of 49CFR 107.105 in effect as of **October 1, 2001**.

49CFR 107.105:	Application for exemption.
49CFR 107.105(a):	General
49CFR 107.105(a)(1):	The requested need date for this modified exemption is **October 1, 2003**
	Two copies of this exemption have been delivered to:
	Associate Administrator for Hazardous Materials Safety Research and Special Programs Administration U.S. Department of Transportation 400 7th Street, SW Washington, D.C. 20590-0001 Attention: Exemptions, DHM-31
49CFR 107.105(a)(2):	The correct applicant name, address and responsible agent for this exemption is:
	Applicant: Connecticut Yankee Atomic Power Company (CYAPCO) 362 Injun Hollow Road East Hampton, CT 06424-3099 Attention: Mr. G. P. van Noordennen Regulatory Affairs Manager Telephone: (860) 267-3938

ENCLOSURE I

REVISED COMPLIANCE MATRIX

EXEMPTION REQUEST FROM THE PACKAGING REQUIREMENTS OF 49 CFR 173 FOR THE SHIPMENT OF THE HADDAM NECK PLANT (HNP) REACTOR VESSEL TRANSPORT SYSTEM

49CFR 107.105(a)(3):	**CYAPCO** is a United States corporation.
49CFR 107.105(a)(4):	This is not a request for a Manufacturing Exemption.
49CFR 107.105(b):	*Confidential treatment* Confidential treatment of this exemption is not requested.
49CFR 107.105(c):	*Description of exemption proposal*
49CFR 107.105(c)(1):	With regard to the transportation of one reactor vessel within a Reactor Vessel Transport System (RVTS) from the Connecticut Yankee (CY) site in Haddam Neck, Connecticut, to the low level radioactive waste burial site at Barnwell, South Carolina, the Applicant seeks relief from the requirements of 49CFR 173 as follows; <u>PACKAGING REQUIREMENT</u> The requirement of 49CFR 173.427(a) that low specific activity (LSA) material must be packaged in accordance with 49CFR 173.427(b) or (c). <u>DOSE RATE AT 3 METERS</u> The requirements of 49CFR 173.427(a)(1) regarding the 10 mSv/hr (1 Rem/hr) radiation dose limitation at 3 meters from the unshielded material. <u>LSA III DEFINITION</u> The requirements of 49CFR 173.403 regarding the definition of LSA-III material, which does not provide for surface contaminated LSA material.

LSA III MATERIAL LEACH TESTING

The leach testing required by 49CFR 173.468 for LSA III material which is also included in the definition of LSA III in 49CFR 173.403.

Sec 173.403 Definitions requires that LSA materials consist of Class 7 (radioactive) material with limited specific activity and the determination of such specific activities may not consider the shielding materials surrounding the LSA material. For LSA-III solids, this Section further provides:

1. That such materials meet the requirements of 49CFR 173.468, which provides detailed requirements for the LSA III leach testing and,

2. Have the Class 7 (radioactive) material "distributed throughout a solid or a collection of solid objects", and,

3. Have an average specific activity not to exceed 2x10-3 A2/g, and,

4. Consist of Class 7 (radioactive) material which is relatively insoluble so that even under loss of packaging, the loss of material by leaching in water for 7 days shall not exceed a 0.1 A2 quantity.

FREE DROP TEST

The drop orientation requirements of 49CFR 173.465(c) that IP-2 packages must satisfy the requirements of a drop test onto the target so as to suffer maximum damage to the safety features being tested.

STACKING TEST

The requirements of **49**CFR 173.465(d) which requires IP-2 packages to be subjected to a stacking test for a period of at least 24 hours with a compressive load equivalent to five times the mass of the package.

49CFR 107.105(c)(2): The specific modes of transportation for this exemption request are:

1) Motor Vehicle Transportation
2) Barge Transportation

The reactor vessel will be transported from the HNP facility site property by barge to the Savannah River Site (SRS) where it will then be transported by land transporter to the Barnwell facility. All transportation will be performed in accordance with **the revised Transportation and Emergency Response Plan as provided in this application.**

49CFR107.105(c)(3): A detailed description of the proposed exemptions follows as well as the basis for the exemption requests.
49CFR107.105(c)(5):

The Class 7 (radioactive) materials consist of the activated reactor vessel and the immovable activated reactor internals components which are grouted in place within the reactor vessel. These materials will be transported within a RVTS comprised of, (i) a Reactor Vessel Canister (hereinafter referred to as Canister) which provides the packaging, (ii) a tie-down system and, (iii) a Transportation and Emergency Response Plan. This RVTS provides safety equivalent to that of an Industrial Package Type 2 (IP-2) as described below.

The HNP reactor vessel with its intact grouted reactor internals, represents "a collection of solid objects" under the definition of LSA material since each reactor internals component within the vessel and the vessel itself have concentrations of Class 7 (radioactive) materials below the LSA-III limit of 2x10-3 A2/g. On average, the reactor vessel plus the internals, excluding the grout, (i.e., the Class 7 material) have a specific activity of 5.71E-6 A2/g. This specific activity corresponds to about 5.8 percent of the LSA-II limit and less than 0.4 percent of the LSA-III limit. The most radioactive individual component, bottom core barrel section (41 inches) within the reactor internals, has a specific

activity of 1.57E-4 A2/g. This specific activity corresponds to less than 8 percent of the LSA-III limit.

The bases for the exemption requests are due to, (i) the unique characteristics of the Class 7 (radioactive) material to be transported, (ii) its packaging and, (iii) the administrative controls that will be implemented during transportation. The basis for each exemption requested is discussed below.

The shipment of the reactor vessel is one-time only, and therefore demonstration of compliance to the regulations at the end of the exemption period is not required.

PACKAGING REQUIREMENT

49CFR 173.427(a) requires LSA material to be packaged in accordance with paragraph (b) or (c) of this section. For LSA III material transported as an exclusive use shipment, 49CFR 173.427(b) and Table 8 of 49CFR 173.427 would require that the vessel be packaged in an Industrial Package Type 2 (IP-2). IP-2 package design and certification requirements are stipulated in 49CFR 173.411. Under the requirements of 49CFR 173.411(b)(2), each IP-2 must meet the general design requirements of 49CFR 173.410 and prevent the loss or dispersion of radioactive material and significant increases in the radiation levels under the testing requirements of 49CFR 173.465(c) and (d) or evaluated in accordance with 49CFR 173.461(a).

The applicant proposes to transport the Class 7 (radioactive) materials using an RVTS (non-specification packaging) which provides safety equivalent to an IP-2 package when transported in accordance with its Transportation and Emergency Response Plan. Technical data concerning the HNP Canister and its tie-down system is provided by the combination of: (i) the Transport System Description Report (TSDR) provided in the original application dated March 30, 2000, and **(ii) the revised Addendum to the TSDR, Enclosure 2 of this application for modified exemption. The revised Transportation and Emergency Response Plan is provided in this application for modified exemption.**

The Canister provides containment of the Class 7 (radioactive) material by the following means:

- There will be closure of all reactor vessel penetrations.

- The reactor vessel interior will be filled with low density cellular concrete (LDCC) grout (25-30 lb/ft^3) to fix the surface contaminants and reactor internals components in place. **Foam rubber slugs that were used to clear the grout between the injection pump discharge and grout lance will be embedded in the concrete grout.**

- The reactor vessel exterior surface contamination will be evaluated based on survey results. Appropriate measures will be taken to meet the LSA III requirements of 49 CFR 173.

- The reactor vessel will be placed within a steel Canister with a thickness of 3 inches for containment of the activated metals components.

- The reactor vessel will be enclosed within the Canister with a full penetration circumferential closure weld.

- For each canister top opening that is not used for on-site rigging, a steel plug or cover plate with a thickness of at least three (3) inches will be welded into or directly over the opening. These welded plugs or cover plates will provide a seal between the Class 7 (radioactive) materials and the environs.

- Following on-site down-ending of the canister, the rigging studs which penetrate the canister will be cut off flush with the shear ring attached to the canister top plate. Each of the corresponding top plate/shear ring openings will be covered using three (3) inch thick carbon steel caps welded to the shear ring. These welded caps or cover plates will provide a seal between the Class 7 (radioactive) materials and the environs.

- The annular space between the reactor vessel and the Canister will be filled with low density cellular concrete (LDCC) grout with a nominal strength of 1,000 psi and a nominal density of 70 lb/ft^3. **Foam rubber slugs that will be used to clear the grout between the injection pump and grout lance will be embedded in the concrete.**

- The exterior of the Canister will be painted.

This robust packaging thus includes multiple provisions to prevent release of the Class 7 (radioactive) material during normal transport conditions.

The RVTS provides equivalent safety to an IP-2 package by ensuring that the Canister is designed in accordance with all the general design requirements specified in 49CFR 173.410. The Canister is also designed in accordance with the additional design requirements for IP-2 packages of 49CFR 173.465(c), and (d) within the limitations of the Transportation and Emergency Response Plan.

All HNP reactor vessel activities will be controlled by the Transportation and Emergency Response Plan, which in part requires that the HNP Canister be handled in an essentially horizontal position during all transportation evolutions. Therefore, the Canister was analyzed for a 1 foot drop in the horizontal position with a 2 foot slap down at either end as opposed to the orientation, which would cause "maximum damage to the safety features being tested". Technical information concerning this analysis is provided by the combination of: (i) the TSDR provided in the original application dated March 30, 2000, and **(ii) the revised Addendum to the TSDR, Enclosure 2 of this application for modified exemption.** Analyzing these horizontal drop scenarios is conservative for the conditions of transport regulated by the Transportation and Emergency Response Plan.

It should be noted that the transportation requirements for LSA material presented in 49CFR 173.427(a) will be met with the exception of the packaging requirements discussed above and the dose rate at 3 meters from the unshielded material specified in 49CFR 173.427(a)(1) presented below.

DOSE RATE AT 3 METERS

The unshielded reactor vessel with reactor internals within, satisfies the dose rate limitation of 10 mSv/hr as per 49CFR 173.427(a)(1). The worst case dose rate at 3 meters from the unshielded reactor vessel exterior is calculated to be 5.3 mSv/hr (530 mRem/hr). This is an estimated dose rate based on characterization results of the Reactor Pressure Vessel and

internals normalized to measured survey results obtained on the thermal shield after its removal. These normalized results were further benchmarked to surveys taken on the reactor vessel exterior on contact with the mirror insulation. The reactor vessel and the reactor internals components are considered as a collection of solid objects and it has been shown above that the worst case component concentrations are well within the limitations of 49CFR 173.403. The unshielded dose rate at 3 meters from some components, if considered separately, will exceed 10 mSv/hr. However, these internal components are an integral part of the reactor vessel.

The 3 meter radiation level requirements of Sec 173.427 (a)(1): The basis for this requirement is loss of package shielding under normal conditions of transport and the resultant dose if the package surface radiation level exceeds 10 mSv/hr at 3 meters. The worst case dose rate at 3 meters from the unshielded reactor vessel exterior is calculated to be 5.3 mSv/hr (530 mRem/hr).

Some components with the reactor vessel, by themselves, will lead to 3 meter dose rates, greater than 10 mSv/hr. However, these internals components are an integral part of the reactor vessel. They are contained inside the reactor vessel itself and surrounded by grout within the vessel. Thus, even if the integrity of the Canister is breached in its entirety under normal transport conditions, the dose rate at 3 meters from any of these components could not exceed the maximum dose rate of 5.3 mSv/hr at 3 meters from the exterior surface of the reactor vessel. Surface contamination on the activated metals was accounted for in the characterization and in determining the nuclides present.

LSA III DEFINITION

The definition of LSA III material includes provisions for consideration of activated metals as LSA III, but does not specifically address activated metals which are also surface contaminated. Although the definition does not include surface contaminated LSA material, the applicant does not believe it was intended to exclude activated metals with surface contamination. As a practical matter, any activated metals generated in a commercial reactor will have some level of surface contamination.

LSA III LEACH TESTING REQUIREMENTS

The reactor internal components and the reactor vessel interior have contaminants on their surfaces. The amount of Class 7 (radioactive) materials from surface contamination is conservatively estimated to consist of about 190 curies including about 5.2 curies of Transuranic activity. This Transuranic activity corresponds to about 149 of A2 values. These contaminants will be grouted onto their surfaces and enclosed within the reactor vessel.

The exterior surface of the reactor vessel also has surface contamination. Surface contamination will be evaluated based on survey results and the appropriate measures taken to meet the LSA III requirements of 49 CFR 173. After placement of the reactor vessel within the Canister, LDCC will be placed in the annulus between the reactor vessel and the Canister.

We do not consider a scenario which could expose leachable surface contaminants to water for seven (7) days credible due to, (i) combination of the containment of the leachable radioactivity within the grout, (ii) the Canister design features and, **(iii) the revised Transportation and Emergency Response Plan presented in this application for modified exemption.**

FREE DROP TEST

Per the requirements of 49CFR 173.465(c), the package must satisfy the requirements of a drop test onto the target so as to suffer maximum damage to the safety features being tested. The drop orientation that causes *"maximum damage"* is typically one where the package center of gravity (cg) is located directly over one of the package corners. The package's size, weight, and handling operations constrain the package to a horizontal orientation during all transport operations once outside the Containment at the HNP. Within this framework, a 1 foot flat side drop and a 1 foot horizontal drop onto either corner followed by a 2 foot slap down represents the worst case orientation during normal conditions of transport for this package. In lieu of a physical drop test, the package was analyzed under these conditions to demonstrate compliance with the free drop requirement. Technical information concerning this analysis is provided by the

	combination of: (i) the TSDR provided in the original application dated March 30, 2000, and **(ii) the revised Addendum to the TSDR, Enclosure 2 of this application for modified exemption.**
	STACKING TEST
	49CFR 173.465(d) requires IP-2 packages to be subjected to a stacking test for a period of at least 24 hours with a compressive load equivalent to five times the mass of the package. It is requested that the package be exempted from the stacking test requirement since it will be a unique one-time shipment, transported exclusive use and stacking is not credible.
49CFR 107.105(c)(4):	The current project schedule identifies the date of departure of the reactor vessel, within the RVTS, from the HNP facility site on or after **November 18, 2003. Transport to the burial disposal facility should be accomplished within 30 to 60 days. The existing exemption expires on June 30, 2004. We request that the modified exemption for the RVTS be applicable for two (2) years from the requested approval date of October 1, 2003.** This will provide allowances for any unforeseen delays.
49CFR 107.105(c)(6):	The Applicant is not requesting emergency processing under Sec. 107.117.
49CFR107.105(c)(7):	Identification and description of hazardous material:
	The estimated activity of all reactor vessel components (including GTCC components that have been removed from the vessel and LLRW components) is the estimated activity on the previous date of September 1, 2000: approximately 809,000 curies.
	The reactor vessel package of the RVTS will only contain LLRW meeting all 10CFR Part 61 requirements for disposal as LLRW. The reactor vessel package of the RVTS will contain LLRW. This LLRW includes reactor vessel internals that contain approximately 35,800 curies. When these LLRW internals are combined with the reactor vessel, the reactor vessel package of the RVTS will consist of approximately 738,000 lbs. of activated metal

	containing approximately 40,700 curies: approximately 40,500 curies from activation products and approximately 190 curies from surface contaminants. The GTCC waste (which will not be included in the reactor vessel package of the RVTS) consists of about 37,400 lbs. of activated metal and contains approximately 769,000 curies. The GTCC components are the core barrel assembly, the lower core plate, and an 89 inch section of the lower core barrel that resided in the active fuel region. The GTCC components within the reactor vessel have been segmented and removed from the reactor vessel. These GTCC components are stored at the HNP site. GTCC components will not be included in the reactor vessel package of the RVTS. Detailed description of the characterization of the reactor vessel and activated internal components is provided by the combination of: (i) the report "Haddam Neck Reactor Vessel and Internals Characterization" provided in the original application, dated March 30, 2000 and **(ii) Addendum to the Characterization Report, Enclosure 3 of the application for modified exemption, dated June 12, 2002.**
49CFR 107.105(c)(8):	An exemption is requested for the following shipment: The HNP reactor vessel with reactor internals approved as LSA-III material within a Canister and associated tie-down system, which is a non-specification package transported in accordance with a Transportation and Emergency Response Plan (TERP) which together comprise a Reactor Vessel Transport System. Technical data concerning the HNP Canister and its tie-down system is provided by the combination of: (i) the **TSDR** provided in the original application dated March 30, 2000 and **(ii) the revised Addendum to the TSDR, Enclosure 2 of this application for modified exemption. The revised Transportation and Emergency Response Plan is provided in this application for modified exemption.**
49CFR 107.105(c)(9):	CYAPCO and its contractors will perform RPV transportation activities in accordance with their respective 10CFR Part 50 Appendix B, QA programs. As such, engineering evaluations,

	welding and preparation of the RPV for transport will be performed in accordance with the CYAPCO QA program. CYAPCO will provide oversight of the entire project.
49CFR 107.105(d)	*Justification of exemption proposal*
49CFR 107.105(d)(1):	A description of relevant shipping and incident experience follows: The Shippingport reactor vessel was successfully shipped to Hanford, Washington under DOE regulations. The Yankee Rowe **and Maine Yankee reactor vessels** were successfully shipped to Barnwell, South Carolina and the Trojan reactor vessel was successfully shipped to Hanford, Washington under NRC regulations (10CFR 71). The Saxton reactor vessel with internals was successfully shipped to Barnwell, South Carolina under a similar DOT exemption request (DOT E- 12114). Steam generators have also been successfully transported by land and water from Yankee Rowe, Salem, Trojan, Millstone, St. Lucie, Maine Yankee, and the Haddam Neck Plant.
49CFR 107.105(d)(2):	The Applicant is not aware of any increase in risk to safety or property that would result from issuing the requested exemptions.
49CFR 107.105(d)(3):	Either of the following, as applicable:
49CFR 107.105(d)(3)(i):	The applicant has designed the Canister in accordance with all the general design requirements specified in 49CFR 173.410 as well as the testing requirements 49CFR 173.465(c) and (d) within the limitations of the Transportation and Emergency Response Plan. The reactor vessel with internals is fully enclosed and grouted inside the Canister. The Canister within the RVTS was evaluated to confirm the capability, in accordance with Table 12 of 173.465, to safely withstand a free horizontal drop of the package from a height of 1 foot onto a flat non-yielding surface without loss of containment. Horizontal drop scenarios on either end from heights of 1 foot with a slap down of 2 feet at the opposite end were considered. Technical data concerning these evaluations is provided by the combination of: (i) the **TSDR** provided in the application dated March 30, 2000, and **(ii) the revised Addendum to the TSDR, Enclosure 2 of this application for modified**

exemption. These evaluations are conservative relative to the limitations of the Transportation and Emergency Response Plan.

There are no other attachments or protrusions on the Canister, except structural cylindrical skirts at both ends designed to absorb energy in the event of a free drop with initial impact at the top or bottom.

Compliance with the testing requirements specified in 49CFR 173.465 for the 1 foot horizontal drop calculations is demonstrated in accordance with 49CFR 173.461(a)(4). Technical information concerning this analysis is provided by the combination of: (i) the **TSDR** provided in the original application dated March 30, 2000, and **(ii) the revised Addendum to the TSDR, Enclosure 2 of this application for modified exemption.**

Due to the physical configuration of the HNP reactor vessel and the intact vessel internal components within the Canister, this exemption request does not pose increased risk to the public health and safety since there is no credible scenario under normal transport conditions resulting in direct exposure to the Class 7 material included in the reactor internals components.

A detailed discussion of the package design relative to the requirements of 49CFR 173 is provided by the combination of: (i) the **TSDR** provided in the original application dated March 30, 2000, and **(ii) the revised Addendum to the TSDR, Enclosure 2 of this application for modified exemption.** The package design and transportation plan with the requested exemptions and alternatives achieve a level of safety equal to or greater than that of an IP-2 package.

49CFR 107.105(d)(3)(ii): This section is not applicable to this exemption request.

ENCLOSURE 2

REVISED ADDENDUM

TO

TRANSPORT SYSTEM DESCRIPTION REPORT (TSDR)

HADDAM NECK PLANT

REACTOR PRESSURE VESSEL*

AUGUST 2003

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* This is a revision to the TSDR Addendum that comprised Enclosure 2 of CYAPCO's request for modification of exemption, dated June 12, 2002.

Revised Addendum to Transport System Description Report

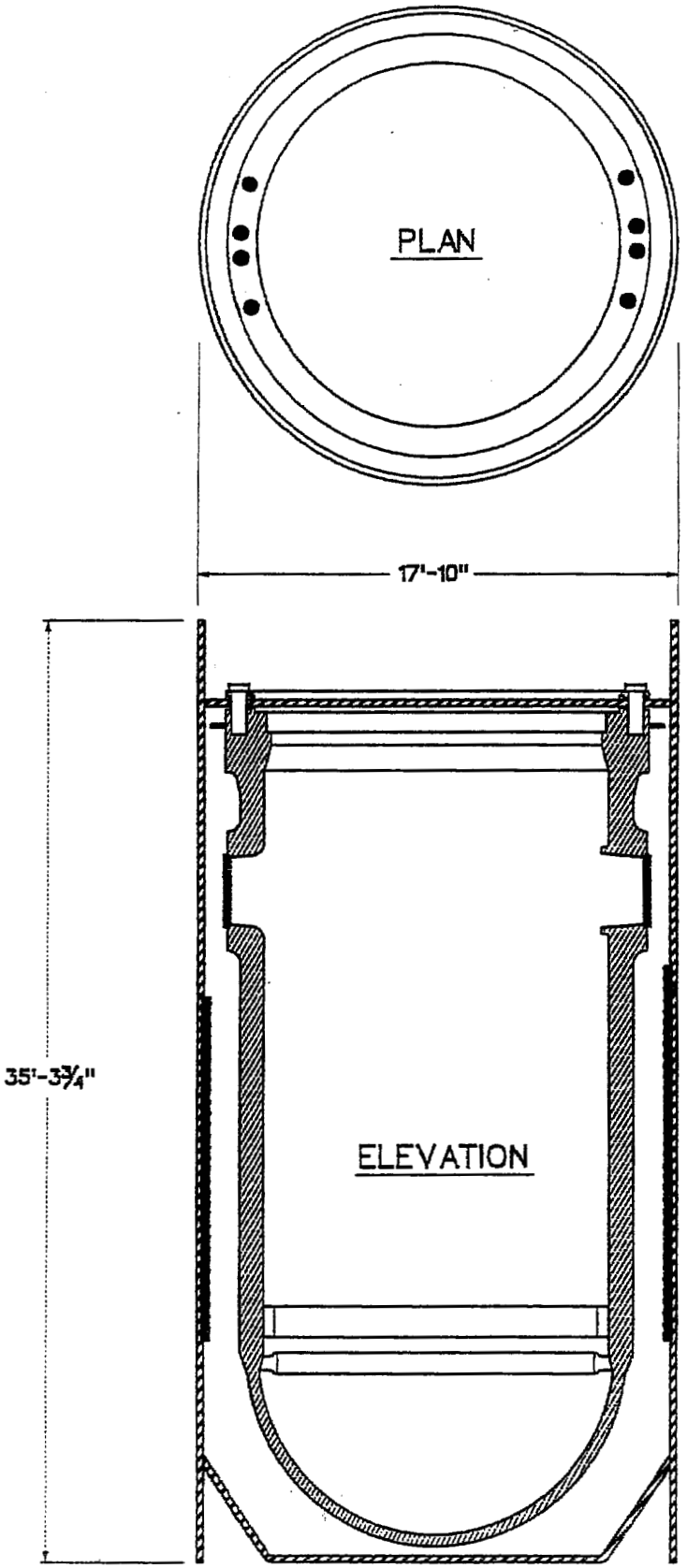
TSDR Section	Comments Concerning Reconfigured RVTS
1.2.1: Radioactive Contents & 1.2.2: Non-Radioactive Contents	Primary changes to the configuration of the Reactor Vessel Transport System (RVTS) are the absence of the following items that were previously planned for inclusion: • Reactor vessel closure head (absent as an attachment to exterior of canister) • Reactor vessel nozzles (absent from RVP package) • Reactor vessel insulation (absent from RVP package) • **The hold down spring has been segmented and placed on the ALARA Shield** The RPV package of the RVTS continues to include segmented metal components in the locations that are shown in Figure 1-1 of Report WMG 9919-9007, Revision 1, Transport System Description Report (TSDR). The total curie content is approximately 40,500 curies from activation products and approximately 190 curies from surface contaminants. As discussed in the commentary concerning TSDR Section 3.6.3, this value of 40,700 curies represents about 1,910 A2 quantities with average concentrations less than 0.4 percent of the LSA III materials limit.
1.2.3: Package	With the identified absence of closure head, vessel nozzles, and vessel insulation, the weight of the canister with its contents, including grout, is about 700 tons (Supplemental Reference #1, Bechtel Engineering Judgment Document 24265-200-30V-C12K-00012-000), rather than about 800 tons as previously reported. In the reconfigured RPV package, RPV closure studs are not used to attach the RPV to the canister. Rather, the position of the RPV in the canister is maintained by: (i) the nominal 70 lb/ft^3 low density cellular concrete (LDCC) in the bottom and annular regions of the canister and **(ii) an approximately 12 inch layer** of nominal 120 lb/ft^3 structural grout at the top of the canister. The structural grout within the top of the canister also supports on-site rigging operations. On-site rigging operations include the use of eight rigging studs that pass through penetrations in the canister top plate and fasten to the upper flange of the RPV. Following the transfer of the loaded canister to the cradle of the RVTS, each of these eight rigging studs will be disabled by: (a) cutting off the stud flush with the shear ring attached to the top plate and (b) welding a three (3) inch thick carbon steel cap over the corresponding penetration in the top plate/shear ring. Each of the welded steel caps provides a metallic seal between radioactive contents and the environs. For each of the other canister top plate penetrations (corresponding to the previously planned attachment of the closure head), a steel plug or cover plate with a thickness of at least 3 inches will be welded into or directly over the penetration. Each of the welded steel plugs or cover plates provides a seal between the radioactive contents and the environs. With the application of these sealing devices, the reconfigured RVTS does not require and, consequently, does not include application of spray metalizing as a sealant.

TSDR Section	Comments Concerning Reconfigured RVTS
Figure 1-4: "HNP Package Shipping Configuration"	Addendum Figure 1 displays the reconfigured Package Shipping Configuration.
2.1: Materials of Construction	With the changes in radioactive content and packaging, the materials of construction of the RVTS do not include the following materials listed in Section 2.1 of the TSDR: • AISI-4340 (SA-193) – The reconfigured RVTS does not use the original RPV closure studs for package closure. • Spray Metalizing – The reconfigured RVTS does not use spray metalizing to seal closure studs around the package top. The materials of the reconfigured closures for package top penetrations are materials of construction that are listed in Section 2.1 of the TSDR. Specifically, these listed materials are ASTM A36 steel and weld materials specified as required per American Welding Society (AWS) D1.1 – 1998, Structural Welding Code – Steel. Additionally, as described in the commentary concerning TSDR Section 1.2.3, **an approximately 12 inch layer** of nominal 120 lb/ft^3 structural grout at the top of the canister supports on-site rigging operations. **Foam rubber slugs will be embedded in the grout used to fill the RPV and the shipping package. These foam rubber slugs will be utilized to clear the grout between the injection pump discharge and grout lance between lifts. These foam rubber slugs are not a material of construction, but have been identified to ensure the exemption request is complete.**
2.5: Tie-down System	With the identified absence of closure head, vessel nozzles, and vessel insulation, the center of gravity of the loaded canister of the RVTS is different from the previously planned configuration. In order to more evenly distribute the footprint loads of the cradle, the canister is reversed in the RVTS cradle. An evaluation of the relevance of previous analysis to the reconfigured RVTS is provided by Supplemental Reference #1 Bechtel Engineering Judgment Document 24265-200-30V-C12K-00012-000.
2.5.1: Tie-down System Design Criteria and Analysis Results	Supplemental Reference #1 concludes that the previously referenced analyses for the tie-down system and the cradle are valid for the reconfigured RVTS.
Figure 2-1: "Tie-down System"	Addendum Figure 2 displays the reconfigured tie-down system configuration.
3.1.6: General Design Requirements – Normal Transport Vibration (173.410 (f))	Supplemental Reference #1 concludes that the previously referenced analyses of vibrational loads are valid for the reconfigured RVTS.
3.1.7: General Design Requirements – Chemical Compatibility (173.410 (g))	As previously stated in regard to Materials of Construction, the reconfigured RVTS does not include either reactor vessel studs or spray metalizing.
3.2: Free Drop Under 173.465 (c) as per 173.411 (b)	Supplemental Reference #3 is a re-evaluation of the original impact analysis using the updated configuration (changes in weight and Center of Gravity (CG) as new physical input. The free drop (impact) re-evaluation found that (i) the original analysis assumptions remain valid and (ii) the package CG impact values increase from 5 to 15% over original values, resulting in little effect on the package. This conclusion is confirmed by the results of the Supplemental Reference (continued)

TSDR Section	Comments Concerning Reconfigured RVTS
3.2: Free Drop Under 173.465 (c) as per 173.411 (b) (continued)	(continuation) #1 study, which used the new impact results as input to the package stress analysis. That engineering study found that resulting package stresses are either less than original values (due to the 12.5% weight reduction) or continue to be within applicable code allowables. Therefore, the conclusions described in Section 3.2.1 of the TSDR remain valid.
3.5: Thermal Evaluation	As stated in Supplemental Reference #2 (Bechtel Document No. 24265-100-V00-MV00-G00500-01), the reconfigured RVTS is consistent with the previously applied conduction model applied in analysis of thermal load for the package. In the applied model, the primary source of heat is radioactive decay of Co-60. In comparison to the segmented internals within the reactor vessel, the Co-60 contribution of the head, insulation, and nozzles was minimal.
3.6.3: LSA Limit Classification (including Table 3-1 "HNP Reactor Vessel Internals DOT Classification Summary" & Table 3.2 "HNP Bottom Core Barrel Section (41 inches) DOT Classification Summary"	In the original application for exemption, dated March 30, 2000, the total radioactive waste of the RPV package of the Reactor Vessel Transport System (RVTS) was categorized as 49 CFR – LSA III for transportation. The reconfigured RVTS does not include the following components which were previously included: • Reactor vessel closure head • Reactor vessel nozzles • Vessel insulation The RPV package of the RVTS continues to include the segmented metal components shown in Figure 1-1 of the TSDR. Consequently, the reconfigured RPV package contains 738,000 lbs. of activated metal (Supplemental Reference #2), rather than 939,000 lbs. The conservatively calculated value of total curie content remains the value that was calculated for shipment dates on or after September 1, 2000: 40,700 curies consisting of approximately 40,500 curies from activation products and approximately 190 curies from surface contaminants on components within the canister. Based on the weight of activated metal and the curie contribution from activation products, the average A2/g value for the reconfigured RPV package is approximately 5.71E-06. This value is less than 0.4 percent of the LSA III limit and only about 5.8 percent of the LSA II limit. With this average A2/g value, it remains valid to classify the package for transportation based upon the DOT classification summary for the worst case material within the package, the bottom core barrel section. As identified from Table 3-2 of the TSDR (which is unchanged), this material has an A2/g value of 1.57E-4, which is less than 8 percent of the LSA III limit. Therefore, the radioactive waste of the reconfigured RVTS remains categorized as 49 CFR – LSA III for transportation.

TSDR Section	Comments Concerning Reconfigured RVTS
4.0: Shielding Evaluation – Introduction Paragraph	Figure 4-1 of the TSDR is a Y-Z cross section of the modeled RPV and internals in their anticipated shipping configuration. As summarized in Supplemental Reference #2, the analytical results from the application of this shielding model are applicable to all geometric vectors from the reconfigured RVP package, including vectors that intersect the top of the canister, with its reconfigured penetration closures. The features of the reconfigured RVP package are: (a) no change to the geometry of the source material, **(b) no changes to the location of the ALARA shield,** (c) no change to the thickness or material of the top of the canister, and (d) penetration closures for the top of the canister that have dimensions which are consistent with the shielding provided by the 3" thickness of the canister top plate. The reconfigured RVTS does not include the reactor vessel head as an attachment to the exterior of the top of the canister. **Additionally, the center plug of the ALARA shield will not be included in the RVTS. The ALARA shield is 94% intact, with the remaining portion having a thickness of three inches (Supplemental Reference #5).**
4.3: Dose Rates from Package Exterior During Transport (173.441)	This section of the TSDR refers to calculated dose rates from the exterior of an anticipated RPV package on September 1, 2000. As stated in Enclosure 3, Addendum to the Reactor Vessel and Internals Characterization, for any later shipment date, the analytical assumptions and results corresponding to the earlier date continue to be valid.
4.3.1: Shielding Configuration & Figure 4-3 "HNP Reactor Vessel Package Shielding Configuration"	Addendum Figure 3, corresponding to Figure 4-3 of the TSDR, shows the shielding configuration of the canister. As stated in Supplemental Reference #2, the analytical shielding model is consistent with the absence of the reactor vessel head from the exterior of the canister. Additionally, the closure devices for the top penetrations of the canister are consistent with the shielding contribution provided by the canister top plate.
5.0: Waste Classification Under 10 CFR Part 61 & Table 5-1, "HNP Reactor Vessel Internals NRC Part 61 Classification Summary"	As described in the original application, dated March 30, 2000, the 10 CFR Part 61 classification of the RPV package was determined by comparison of the evaluated classifications of individual components of the package. The original comparison of these classifications is described in "Haddam Neck Reactor Vessel and Internals Characterization Report" of the original application (referred to as the "Characterization Report.") Enclosure 3, Addendum to Characterization Report, supplements the comparison of these classifications. Although not applied for actual classification, Section 5.2 of the TSDR provides an alternative classification summary that does not distinguish between components within the package. The cumulative waste weight in the reconfigured RPV package is 738,000 pounds (Supplemental Reference #2). In comparison, the applied waste weight value in TSDR Table 5-1 was 800,000 pounds. (continued)

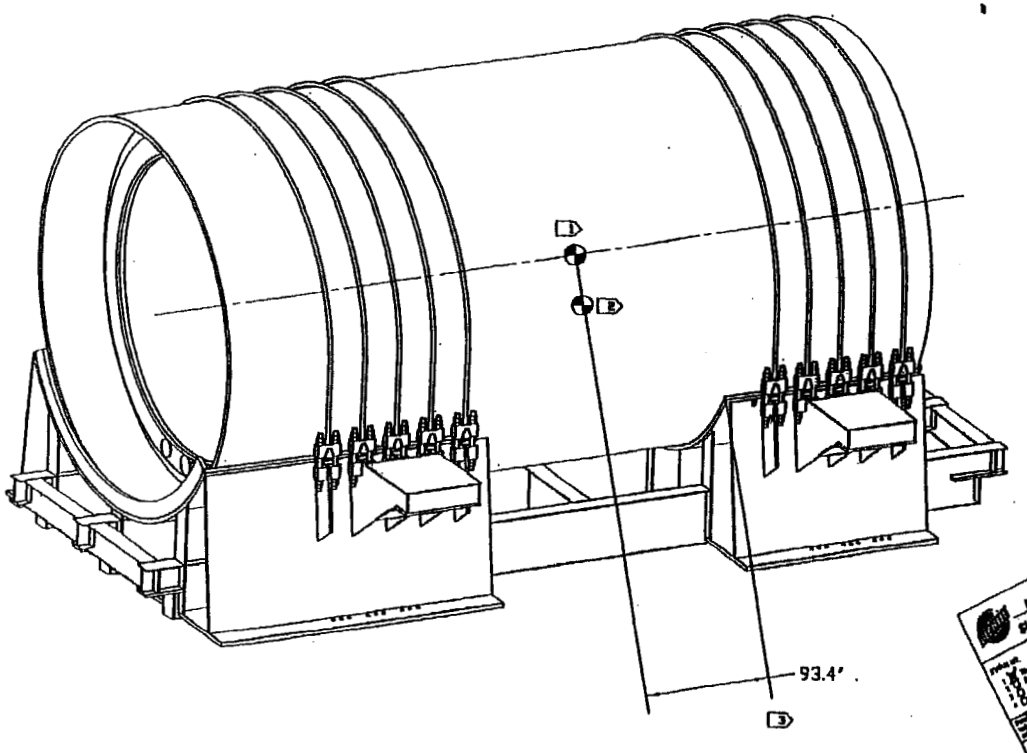
TSDR Section	Comments Concerning Reconfigured RVTS
5.0: Waste Classification Under 10 CFR Part 61 & Table 5-1, "HNP Reactor Vessel Internals NRC Part 61 Classification Summary" (continued)	(continuation) The ratio of the previously assumed waste weight to the reconfigured waste weight is 1.084. The cumulative waste volume in the reconfigured RPV package is 1,475 cubic feet (Supplemental Reference #2). In comparison, the applied waste volume value in Table Figure 5-1 was 1,600 cubic feet. The ratio of the previously assumed waste volume to the reconfigured waste volume is 1.085. Consequently, in determining a bounding degree of possible change in 10 CFR Part 61 Table Fractions from the alternative classification summary of TSDR Table 5-1, a multiplication factor of 1.085 is applicable. The resulting postulated 10 CFR Part 61 Table 1 and Table 2 Fractions remain bounded by the corresponding calculated values for HNP Bottom Core Barrel Section (41 inches) (TSDR Table 5-2). However, as stated in Section 5.0 of the TSDR, "concentration averaging will not be employed." Rather, as previously stated, the 10 CFR Part 61 classification of the RPV package is determined by comparison of the evaluated classifications of individual components of the package.
6.0: References	The references listed in the TSDR are supplemented by the following documents: • Supplemental Reference #1: Bechtel Engineering Judgment No. 24265-200-30V-C12K-00012-000, dated October 22, 2001. • Supplemental Reference #2: Bechtel Document No. 24265-100-V00-MV00-G0050-01, WMG letter dated October 17, 2001. • Supplemental Reference #3: Bechtel Document No. 24265-100-V00-MV00-G0051-01, WMG letter dated October 18, 2001. • Supplemental Reference #4, Bechtel Document No. 24265-100-V00-MV00-G0048-02, WMG letter dated June 7, 2001. • **Supplemental Reference #5, Bechtel Document No. 24265-000-G65-GEHH-P0136-000, dated April 24, 2003.** • **Supplemental Reference #6, WMG letter to Eugene Glasbergen (Bechtel) dated April 25, 2003.**
Appendix A: HNP Cradle Assembly Drawing	Addendum Figure 2 displays the reconfigured cradle and tie-down system configuration.
Appendix B: Sketch – Typical Land Transport Configuration	Addendum Figure 4 replaces the sketch from Appendix B of the TSDR.
Appendix C: Sketch – Typical Barge Transport Configuration	**Addendum Figure 5, Rev. 3** replaces the sketch from Appendix C of the TSDR.

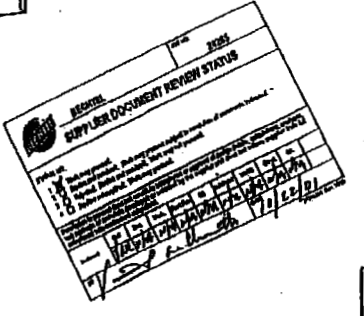


HNP Package Shipping Configuration

ADDENDUM FIGURE 1

1. CENTER OF GRAVITY (PACKAGE) 93.4" FROM INNER FACE OF SADDLE
2. CENTER OF GRAVITY (COMBINED PACKAGE AND CRADLE ASSEMBLY) 93.7" FROM INNER FACE OF SADDLE
3. DIMENSION FROM INNER FACE OF SADDLE.





Packaging Technology, Inc.
A Transnuclear Company

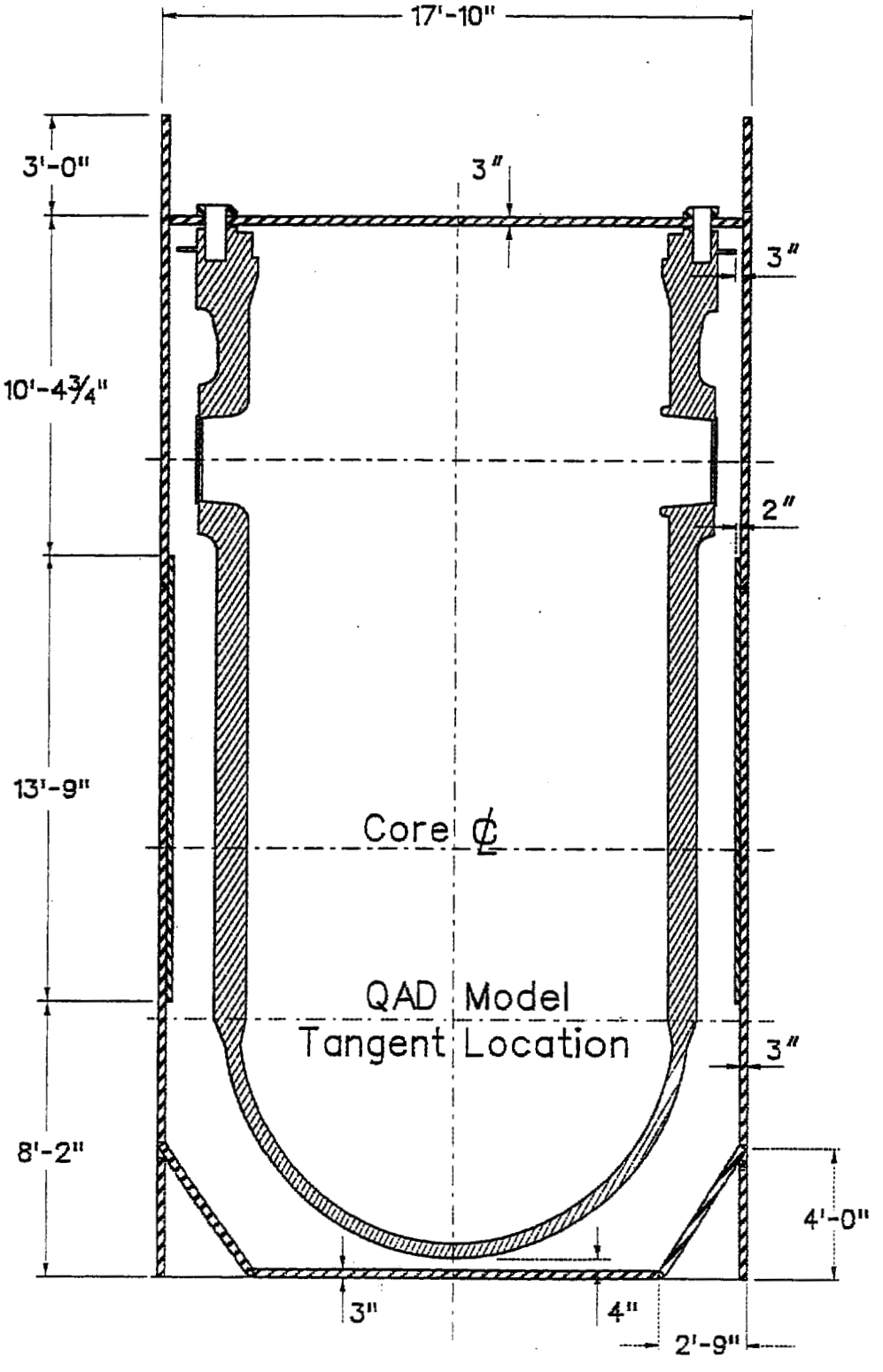
RVP/CRADLE ASSEMBLY
CONNECTICUT YANKEE

SCALE: X | WT. X
REV: X | SHEET X OF X
DWG SIZE: B | DWG NO. SK-117
CAD FILE

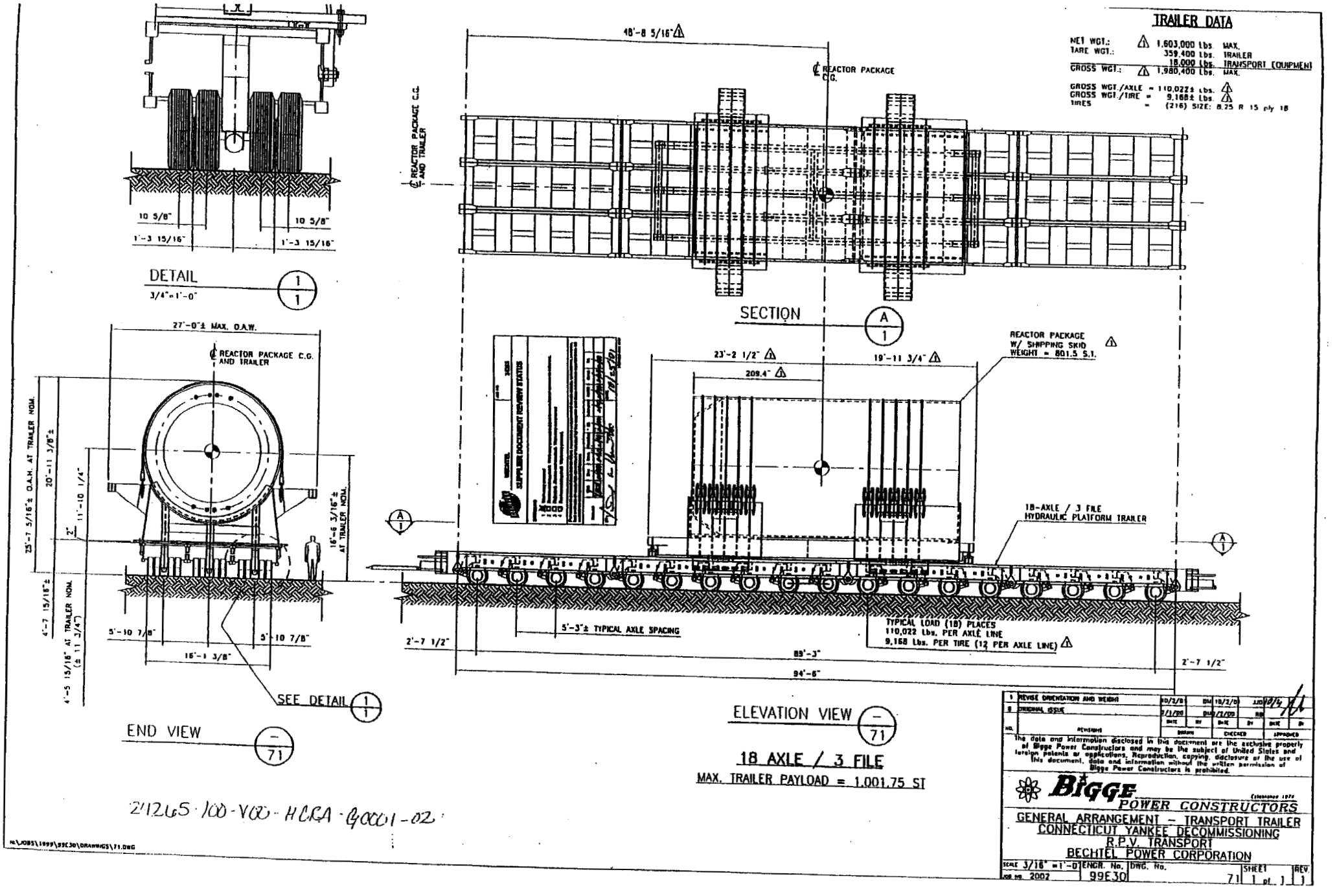
94265-100-V00-mv00-G0052-01

ADDENDUM FIGURE 2

HNP Reactor Vessel Package
Shielding Configuration



ADDENDUM FIGURE 3



2/1265-100-V00-HCRA-Q0001-02

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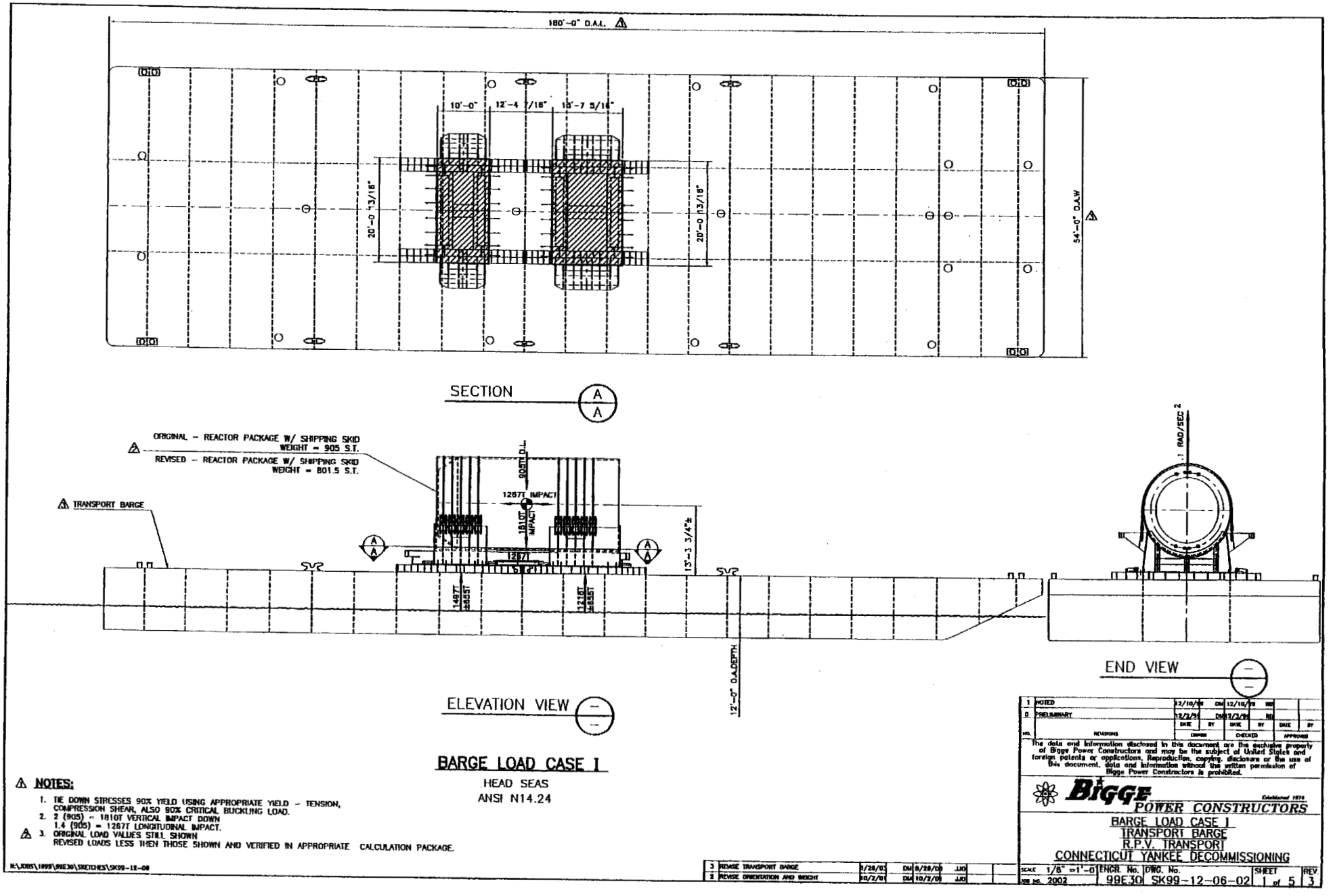
ADDENDUM FIGURE 4



BARGE LOAD CASE 1

HEAD SEAS
ANSI N14.24

NOTES:

1. TIE DOWN STRESSES 90% YIELD USING APPROPRIATE YIELD - TENSION, COMPRESSION SHEAR, ALSO 90% CRITICAL BUCKLING LOAD.
2. 2 (90S) - 1810T VERTICAL IMPACT DOWN
   1.4 (90S) - 1267T LONGITUDINAL IMPACT.
3. ORIGINAL LOAD VALUES STILL SHOWN
   REVISED LOADS LESS THEN THOSE SHOWN AND VERIFIED IN APPROPRIATE CALCULATION PACKAGE.

NO.	REVISIONS	DRAWN DATE	BY	CHECKED DATE	BY	APPROVED DATE	BY
1	NOTED	12/10/99	DM	12/10/99	MB		
0	PRELIMINARY	12/3/99	DM	12/3/99	MB		
3	REVISE TRANSPORT BARGE	8/28/03	DM	8/28/03	JJO		
2	REVISE ORIENTATION AND WEIGHT	10/2/01	DM	10/2/01	JJO		

BIGGE POWER CONSTRUCTORS Established 1874

BARGE LOAD CASE 1
TRANSPORT BARGE
R.P.V. TRANSPORT
CONNECTICUT YANKEE DECOMMISSIONING

SCALE	ENGR. No.	DWG. No.	SHEET	REV
1/8" =1'-0"	99E30	SK99-12-06-02	1 of 5	3

JOB NO. 2002

R:\JOBS\1999\99E30\SKETCHES\SK99-12-08

REVISED ADDENDUM – FIGURE 5

ENCLOSURE 3

REVISED TRANSPORTATION and EMERGENCY RESPONSE PLAN

For

HADDAM NECK PLANT REACTOR VESSEL PROJECT *

TRANSPLAN-9007

AUGUST 2003

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* This is a revision to the Plan that comprised Attachment 4 to CYAPCO's original request for an exemption, dated March 30, 2000.

TRANSPORTATION and EMERGENCY RESPONSE PLAN

For

HADDAM NECK REACTOR VESSEL PROJECT

TRANSPLAN-9007
Rev. 1

August 2003

Prepared for:

Bechtel Power Corporation
And
CYAPCO

Prepared by:

WMG, Inc.
16 Bank Street
Peekskill, NY 10566

TRANSPORTATION AND EMERGENCY RESPONSE PLAN
FOR
CONNECTICUT YANKEE REACTOR VESSEL PROJECT
REPORT TRANSPLAN-9007

WMG Inc.		16 Bank Street, Peekskill, NY 10566
Project Application	Copy No. NA	Assigned To: NA

APPROVALS

SIGNATURE(S) – DATE(S)

Rev. No.	Preparer	Technical Reviewer	Approver
0	Al Freitag 3/9/00	Edward J. Posivak 3/9/00	Kevin Tuite 3/9/00
1	Al Freitag 8/26/03	8/29/2003	8/29/03

FOREWORD

This report comprises Enclosure 3 to the application for the modified Exemption Request for the Connecticut Yankee (CY) Reactor Vessel Transport System. This work was performed under Subcontract 24265-TSC-200.

TABLE OF CONTENTS

APPENDICES

1.0 SCOPE

1.1 Purpose

The purpose of this Plan is to provide comprehensive management, coordination, and control of the shipment of the Reactor Vessel Canister (Canister) from Connecticut Yankee Atomic Power Company (CYAPCO) Haddam Nuclear Plant (HNP) to the Chem-Nuclear Systems operated Waste Management Facility, located in Barnwell, South Carolina (Barnwell Site). The Plan also contains instructions for emergency response during land and water transit between HNP and the Barnwell site.

1.1.1 Applicability

This document is applicable to all **CYAPCO** personnel and subcontractors who are involved in the transportation of the Canister. The Canister will be prepared for off site transportation at HNP per References **2.15 and 2.16**. The transportation of the Canister will commence upon its departure from the HNP's local barge slip and end upon the placement of the Canister in the disposal trench at Barnwell.

2.0 REFERENCES

2.1 U.S. Department of Transportation Exemption Request for Shipment of the Haddam Neck Plant Reactor Vessel Transport System

2.2 Title 49, Code of Federal Regulations

2.3 Title 10, Code of Federal Regulations

2.4 SC Department of Health and Environmental Control (DHEC) 61-83 Regulation

2.5 Attending Marine Surveyor's Report for CYAPCO HNP for RPVP

2.6 Bigge Crane and Rigging Co. Quality Assurance Manual, Project BCR-99-200

2.7 Title 33, Code of Federal Regulations

2.8 CYAPCO Procedures

2.9 46 CFR Part 15 Manning Requirement, Section 15.705 Watches

2.10 Bechtel Project QA Program Plan for the CY Decommissioning Project

2.11 CYAPCO QA Program

2.12 Bigge Procedure BCR-PROC-2002-101, "Project Execution Plan"

2.13 ANSI 14.24

2.14 Bigge Health and Safety Manual

2.15 Bigge Procedure BCR-PROC-2002-103, "Tie-Down Package to Barge CYNP"

2.16 Bigge Procedure BCR-PROC-2002-104, "Transport to Barnwell Site"

2.17 Bigge Procedure BCR-PROC-2002-104.1, "Barge Transport to SRS"

2.18 Bigge Procedure BCR-PROC-2002-104.2, "Load and Tie Down to Transporter"

2.19 Bigge Procedure BCR-PROC-2002-104.3, "Land Transport to Barnwell Site"

2.20 Bigge Procedure BCR-PROC-2002-104.4, "Offload and Set in Trench"

2.21 Bigge Procedure BCR-PROC-2002-105, "Emergency Response Plan"

3.0 RESPONSIBILITIES

Overall project responsibilities and staffing are set forth in Reference **2.12.** Responsibilities relating to the transportation of the Canister are summarized below.

3.1 Connecticut Yankee Atomic Power Company (CYAPCO)

CYAPCO, as the licensed operator of HNP, **contracted** Bechtel as the Decommissioning Operations Contractor **to procure the Canister and develop the transportation plan. CYAPCO subsequently assumed control of the RPV removal packaging and shipment including the offsite transportation of the Canister.** The DOT exemption is issued to CYAPCO, and for the purposes of this plan, CYAPCO is the DOT shipper of record.

3.2 Bechtel Power Corporation (Bechtel)

Bechtel **was** under contract to CYAPCO as the Decommissioning Operations Contractor and **had** the overall responsibility for managing the decommissioning of HNP. **CYAPCO has subsequently assumed control of the RPV removal, packaging and shipping. Specific to this plan, CYAPCO has the responsibility for the preparation and transport of the Canister in compliance with the DOT exemption.**

3.2.1 The Bigge Project Manager (under subcontract to **CYAPCO**) is responsible for the overall execution of off-site land and water transportation of the Canister. The Project Manager will coordinate the efforts of the Marine Surveyor, the Bigge Superintendents, and the Savannah River Site (SRS) Project Manager. The Project Manager shall also ensure adherence to the industrial safety and radiological standards of References 2.2, **2.3 and 2.14**, carrier requirements of References **2.9 and 2.13**, and support emergency actions as may be required by Reference **2.21** and Section 8.0 of this plan.

3.2.2 The **CYAPCO Health Physics Technician (HPT)** is responsible for providing health physics surveillance during transportation of the Canister and for responding to radiological emergencies. The **HPT** will maintain the principles of ALARA **and radiological controls in accordance with industry practices**. This includes providing radiological training indoctrination, maintaining the dosimetry program, and conducting radiation and contamination surveys.

3.3 Bigge Crane & Rigging (Bigge)

Bigge Crane & Rigging, under contract to **CYAPCO**, will provide heavy haul and support services for the off-site transportation of the Canister. This includes, barge and tug service, temporary bridge and loading ramp installation/removal, and crane/rigging services at the SRS and at the Barnwell sites. Bigge will also provide heavy haul and rigging services, to transport the Canister at the SRS and the Barnwell sites. Bigge will supply a hydraulic platform trailer, prime mover and barge off-load rigging equipment. Bigge is designated as the carrier for the shipment of the Canister.

3.3.1 The Bigge Superintendent, or designee, is responsible for supervision of its crews for compliance to the requirements in this Plan and adherence to **radiological and** industrial safety requirements. The Superintendent is also responsible for implementation of the Emergency Response Plan per Section 8.0

3.3.2 The licensed tugboat Captain is responsible for the safety of the barge and crew under his direction, compliance with applicable maritime regulations, directing immediate actions in the event of an emergency per Section 8.0, and supervision of the tug crew to fulfill requirements of this plan and all applicable regulations.

3.4 Marine Surveyor

A registered Marine Surveyor, under contract to Bigge, will provide an attending Surveyor to perform marine surveys of the barge and tug. This includes performance of pre-voyage (Pre-Tow) survey of the barge and **tug** several weeks in advance of the shipment to determine equipment adequacy and condition. Results of this survey will be provided to Bigge for corrective action. Prior to the shipment leaving HNP, the Attending Surveyor will inspect the barge tie-down arrangement for the Canister, and other sea-fasteners as may be required by the Attending Surveyor. The Attending Surveyor will also verify that the **tugboat** and barge meet the requirements of the Pre-Tow and review the Trip-In-Tow recommendations with the tugboat **Captain**.

4.0 GENERAL REQUIREMENTS

4.1 The Bigge Project Manager (or his designee) shall indicate completion of the requirements in Sections 5.2, 5.3, 6.2, 6.3, 7.2, and 7.3 by initialing and dating in the spaces provided.

4.2 Bigge's Quality Assurance Program, having been approved **CYAPCO**, will be implemented to assure items and activities meet or exceed established requirements. QA/QC requirements are contained in Reference **2.6**.

4.3 One barge shipment will be made. The Canister will be tied-down to the barge.

4.4 The **HPT** will accompany the shipment continually during the water transit. Health Physics coverage will also be provided during land transportation between SRS and the Barnwell site.

4.5 Industrial safety requirements shall be followed by all Bigge employees and subcontractors per Reference **2.14**.

4.6 Due to the complexity of operations described in this Plan, it may be necessary to perform steps within a section concurrently or out of sequence. Should this become necessary, the Bigge Project Manager shall seek concurrence from the **CYAPCO** Site Coordinator (for work performed at HNP only) and the appropriate Superintendent(s) for all applicable work.

5.0 BIGGE PREPARATION AT HNP

5.1 Special Instructions/Precautions

(None)

5.2 Prerequisites

Prior to acceptance of the Canister on the barge, the following prerequisites shall be completed and verified per Section 4.1.

5.2.1 CYAPCO's exemption request from US DOT has been approved and exemption certificate issued.

____/____

5.2.2 CYAPCO has received South Carolina Department of Health and Environmental Control (DHEC) approval for the transportation and disposal of the Canister.

____/____

5.2.3 The barge is prepared to receive the Canister per Reference **2.15**, and materials and personnel are available at the barge slip for collection/recovery of oil that may leak from the hydraulic mechanisms associated with the transportation equipment.

____/____

5.2.4 Acceptable weather conditions are forecasted for transport of the Canister.

____/____

5.2.5 Adequate daylight exists to complete the transport, barge loading and installation of a minimum number of barge tie-downs, as specified by the attending surveyor unless provisions for portable lighting are available.

____/____

5.2.6 Arrangements have been made for the marine survey of the tug(s) and loaded barge at HNP.

____/____

5.2.7 **CYAPCO** has completed radiation worker training for **CYAPCO** and Bigge personnel who require monitoring under its program during barge loading and tie-down installation.

____/____

5.2.8 The following courtesy notifications have been completed.

5.2.8.1 CYAPCO: To the town offices for each town along the Connecticut River that were formerly in the Connecticut Yankee EPZ.

____/____

5.2.8.2 Bigge: To the States of South Carolina and Georgia, at least 10 working days prior to the scheduled departure date of the shipment from HNP.

____/____

5.2.8.3 Bigge: To the States along the Intercoastal Waterway route, at least 10 working days prior to the scheduled departure date of the shipment from HNP.

____/____

5.3 Barge Preparation

The following items shall be completed and verified per Section 4.1.

5.3.1 The Bigge Project Manager, or designee, shall conduct a pre-job briefing with personnel involved in the Canister loading, and land transporter tie-down installation.

____/____

5.3.2 Ensure that the land transporter tie-down system is properly secured to the barge per Reference **2.15**.

____/____

6.0 WATER TRANSPORATION

6.1 Special Instructions/Precautions

6.1.1 Various tugs will be used during the voyage to meet the varying draft and duty requirements. The first **tug** will transport the barge from the discharge canal at HNP to the Connecticut River. A second **tug** will transport the barge from the Connecticut River to the inlet for Savannah River per Appendix A-1. A third **tug** may transport the barge from the inlet for the Savannah River to the SRS boat ramp. All tugs will comply with the recommendations of Reference **2.13**. Each tug shall be manned as required per References **2.16 and 2.17** to support 24-hour vessel operation.

6.1.2 A primary and secondary means of communication shall be available between **the in place tug and their base station**.

6.1.3 During the voyage, **the in place tug** shall communicate to the Bigge Communication Center and CNS Barnwell Site Security, the shipment position a minimum of once every 8 hours.

6.1.4 During the voyage, **the in place tug** shall communicate to the Bigge Communication Center, CNS Barnwell Site Security, and the Connecticut Yankee Atomic Power Control Room the following:

- Any scheduled or unscheduled layovers or delays exceeding 2 hours and
- Any unusual events, accidents, or emergencies affecting the shipment.

6.1.5 An emergency hawser will be provided on the barge and standard U.S. Coast Guard procedures for deployment utilized during the barge transport.

6.1.6 Speed will be limited to USCG and/or ANSI N14.24 applicable restrictions and surveyor sailing instructions.

6.1.7 Radar and navigational aides are operational on all vessels.

6.1.8 Except during the emergency situations described in Section 8.0, transportation of the Canister shall be direct and uninterrupted, following the route specified in Appendix A-1.

6.1.9 Prior to departure from any point along the route, the tug Captain is to assure that an acceptable weather forecast exists for the intended route. Acceptable weather forecast is per applicable USCG and/or ANSI N14.24. Should unpredicted conditions prevail, the shipment shall seek shelter per Section 8.0

6.1.10 **The in place tug Captain** shall comply with References **2.17 and 2.18** as prepared by Bigge with comments from the Attending Surveyor. Should conflicts arise between the requirements of this Plan and those prescribed in References **2.17 and 2.18**, those in References **2.17 and 2.18** shall take precedence.

6.1.11 In the event an accident or other circumstance that results in the partial or total sinking of the barge, salvage operations will be employed. Bigge will immediately contact a Salvage Surveyor and Salvage Master to undertake required salvage operations. The first priority of salvage operations will be to mitigate any damage to and initiate recovery of the Canister.

6.1.12 Refer to Section 8.0 in the event of an emergency.

6.1.13 Each member of the tug crew **shall be trained**. Training shall consist of radiation worker training **commensurate with the radiological hazards** and Haz Mat Employee training per 49 CFR 172, Subpart J. The assist boat crew, if required, is exempted from this requirement.

6.1.14 The **Tug** and/or assist boat(s) used to maneuver the barge in the HNP discharge canal shall be of appropriate size and horsepower to safely transport the barge under the prevailing weather and water conditions, as determined by the Attending Surveyor.

6.2 Prerequisites

Prior to the barge leaving the HNP barge slip, the following prerequisites shall be completed by Bigge.

6.2.1 The Canister has been prepared for off site transportation and land transporter system secured to the barge per Reference **2.15**.

____/____

6.2.2 CYAPCO's shipping documentation, surveys, inspections and notifications have been completed and distributed per Reference 2.8.

____/____

6.2.3 Permit between DOE-SRS and CYAPCO authorizing use of SRS facilities and highways is in place.

____/____

6.2.4 Pre-approval for overweight and oversize permits have been obtained from South Carolina DOT.

____/____

6.2.5 Approval received from U.S. Coast Guard for use of SRS boat ramp.

____/____

6.2.6 Permit application submitted to CSX Rail Road requesting rail crossing at SRS is approved.

____/____

6.2.7 The barge and **tug** meet the Pre-Tow Recommendations of Reference. **2.13** as determined by the Attending Surveyor.

____/____

6.2.8 The **HPT** has performed and documented a radiation and contamination survey of the barge.

____/____

6.2.9 A Dangerous Cargo Manifest, prepared by **CYAPCO**, has been signed by the tug Captain.

____/____

6.2.10 The following documents have been provided to each tug Captain and a copy is secured in a weatherproof cover on the barge.

____/____

- Shipping paperwork package prepared by CYAPCO,
- Dangerous Cargo Manifest,
- **CYAPCO** radiological survey,
- References **2.16 and 2.17**, and
- Copy of this Plan.

6.2.11 Each tug has sufficient fuel to complete the planned portions of the voyage.

____/____

6.2.12 The **tug boat** and crew, as prescribed in the preceding sections are available to receive the shipment at the HNP Discharge Canal.

____/____

6.2.13 Arrangements have been made for shallow draft tug service out of Savannah, Georgia

____/____

NOTE: TRANSPORTATION SHALL PROCEED ON THE CONNECTICUT RIVER AND SAVANNAH RIVER ONLY DURING DAYLIGHT HOURS.

6.2.14 **HPT**, equipped with dosimetry and radiation monitoring equipment, is aboard the in place tug and has completed indoctrination of the tug crew.

____/____

6.2.15 Bigge preparation of the SRS boat ramp is complete.

____/____

6.2.16 Primary and backup means of communication between tug and base stations are satisfactorily tested.

____/____

6.3 Transportation

The following items shall be completed and verified per Section 4.1:

6.3.1 **The in place tug** Captain verifies an acceptable weather forecast.

____/____

6.3.2 Under the direction of the tug Captain, unsecure barge mooring lines and remove barge from the slip.

____/____

6.3.3 Tug Captain shall notify the nearest Captain of the Port and Bigge Communications Center of the shipment's departure.

____/____

6.3.4 At the Connecticut River, make up the tug to the barge.

____/____

6.3.5 The shipment will proceed along the route depicted in Appendix A-1.

____/____

6.3.6 At Savannah, GA, the ocean **tug** will be replaced with a river **tug** (as prescribed in References **2.16 and 2.17** for transit on the Savannah River.

____/____

6.3.7 Notify SRS a minimum of four (4) hours in advance of the barge's scheduled arrival at the SRS boat ramp.

____/____

6.3.8 Upon arrival at the SRS boat ramp, moor the barge to the dock area adjacent to the boat ramp.

____/____

6.3.9 **HPT** conduct an arrival radiation and contamination survey of the shipment and establish radiological postings at the gangway.

____/____

6.3.10 Position the barge in boat ramp, moor and make barge ready for off load.

____/____

7.0 LAND TRANSPORTATION AT SRS AND BARNWELL

7.1 Special Instructions/Precautions

7.1.1 Escorts and traffic control will be provided along the haul route to isolate the shipment from commercial vehicle traffic and personnel not directly involved in the shipment and to allow the shipment to proceed without delay or interference.

7.1.2 At SRS, shipment escort will be provided by DOE and Bigge. On State of South Carolina roads, escort will be provided by DOE Security and local law enforcement agencies. Bigge will provide personnel, equipment and materials for traffic control. Traffic control personnel will be under the direction of Bigge/DOE Security.

7.1.3 Speed shall be limited to 5 mph or less.

7.1.4 Bridges, culverts or underground utilities along the route identified by SRS or SC Highway authorities as being structurally inadequate will be spanned using transition beams and/or steel plates.

7.1.5 The prime mover may be parked overnight in one of the designated safe berths along the route. During periods when the prime mover is parked in a safe berth;

- Portable lighting will be established to illuminate the safe berth area,
- Radiological postings will be established around the Canister, and
- Periodic surveillance by SRS Security of the safe berth will be conducted or if parked off SRS property, a watch shall be posted at the safe berth that is equipped with mobile communications.

7.1.6 Refer to Reference **2.21** and Section 8.0 in the event of an emergency.

7.2 Prerequisites

Prior to the shipment leaving the SRS boat landing area, the following prerequisites shall be completed and verified per Section 4.1.

7.2.1 Confirm with the Barnwell Site Manager that the site will be prepared to receive the shipment on the anticipated arrival date.

____/____

7.2.2 Verify that the canister surface temperature is above 0°F before commencing off-load of the canister from the barge to the land transporter.

____/____

7.2.3 Verify that the Canister is properly secured to the land transporter as per Reference **2.18**.

____/____

7.2.4 Verify that traffic control personnel, equipment and supplies are ready to support the movement of the prime mover (including hydraulic oil spill recovery) and that designated safe berths are available.

____/____

7.2.5 Verify that CSX personnel are available at the rail crossing on SRS Road 3 to authorize shipment across the tracks.

____/____

7.2.6 Notifications have been made to local (Barnwell) law enforcement agencies and utility companies of the shipment scheduled departure time from SRS.

____/____

7.2.7 The physical conditions of road and bridge surfaces along the route have been visually documented by Bigge, as necessary.

____/____

7.2.8 The haul route has been surveyed for potential interference from structures such as highway postings, poles etc. and resources are available to remove and re-install them as the shipment proceeds.

____/____

7.2.9 Bigge personnel, equipment, and materials are staged to span bridges, culverts, and underground utilities, as required, along the route.

____/____

7.2.10 Perform pre-departure inspection of prime mover and transporter per Reference **2.19**.

____/____

7.2.11 Original shipping paperwork is placed in the cab of the prime mover.

____/____

7.2.12 HPT conduct a shipment radiation and contamination survey of the prime mover and canister.

____/____

7.2.13 HPT re-inspect the DOT required labels, markings and placarding.

____/____

7.3 Transportation

The following items shall be completed and verified per Section 4.1.

7.3.1 The shipment will proceed along the following route as depicted in Appendix A-2:

River access road to River Road (A-4), South on River Road (A-4) to Road 3, Road 3 through Barricade 7 to Road 5, South on Road 5 to Road 6, East on Road 6 to Road F, South on Road F to Road B, East on Road B to Barricade 4 (Snelling Barricade). From the Snelling Barricade, the shipment will proceed East on SC 64, to the gravel road connecting SC 64 to Osborne Road. Take the gravel road to Osborne Rd, and then proceed to the main gate of the Barnwell site

____/____

7.3.2 Upon arrival at the Barnwell site, the shipment will be inspected and received per References **2.19 and 2.20**.

_____/Chem-Nuclear

8.0 EMERGENCY RESPONSE PLAN

This section is developed to provide instructions for comprehensive notifications, reporting, management, and emergency actions in response to an emergency occurring during the voyage. This section shall be used as a guideline.

NOTE: REFER TO REFERENCE 2.21 FOR HIGHWAY EMERGENCIES.

8.1 Responsibility

8.1.1 Emergency Coordinator: During barge transit, the ocean or river tug Captain shall be designated the Emergency Coordinator who is responsible for the implementation of the emergency plan. All classifications, notifications, assignments, and follow-up actions shall be delineated by the Emergency Coordinator.

8.1.2 Radiation Advisor: The HPT shall coordinate and provide recommendations on any radiological events.

8.1.3 Maintenance Supervisor: The Bigge Superintendent shall coordinate, recommend, and implement mitigating actions to ensure the safe operation of the barge support equipment.

8.1.4 Communicator: The Bigge Communication Center operator is responsible for completing the Emergency Notification Incident Form in Appendix B, taking further actions, and completing notifications per Appendix C.

8.2 Emergency Classifications

NOTE: MORE THAN ONE CLASSIFICATION MAY EXIST AS A RESULT OF AN ACCIDENT. THE GOAL OF THE CLASSIFICATION IS TO BRIEFLY CATEGORIZE AND IDENTIFY POTENTIAL RESPONSES FOR ANY EVENT.

8.2.1 Weather: All weather that threatens the ability of the Captain and crew to safely transport the barge and/or **the in place tug.**

8.2.2 Communications: All events whereby all communications are lost between **the in place tug** and the shore.

8.2.3 Tie-Down Equipment: Any malfunctions of the in-place tie-down equipment that jeopardizes its ability to secure the Canister.

8.2.4 Tugboat: All equipment failures that jeopardize the ability of the in-place **tug** to control the barge.

8.2.5 Radiation Protection: Any significant increase in surface contamination or dose rate at the Canister boundary.

8.2.6 Grounding/Collision: Physical contact made with another obstacle

8.3 Emergency Actions

NOTE: ALL ACTIONS SHALL BE MADE WITH THE FOLLOWING PRIORITIES:

- **PUBLIC SAFETY**
- **PERSONNEL SAFETY**
- **TRANSPORT PROTECTION**

8.3.1 Once an emergency is identified, the Emergency Coordinator shall delegate any immediate actions that may preclude further problems.

NOTE: THE REMAINING ACTIONS ARE BASED UPON THE CLASSIFICATION OF INCIDENT.

8.3.2 Once the immediate actions are delegated, the notifications identified in Appendix C shall be made by the Emergency Coordinator. The Emergency Coordinator may delegate this responsibility to the Bigge Communication Center. The Communicator shall complete an Emergency Notification Incident Form, Appendix B, and any actions as directed by the Emergency Coordinator.

8.3.3 Weather

8.3.3.1 Seek the closest safe harbor and secure barge.

8.3.3.2 Once secured, the Radiation Advisor **(HPT)** shall restrict access surrounding the barge based upon the radiological conditions around the barge.

8.3.3.3 Once the weather has passed and the near term weather conditions are satisfactory, reinitiate transport.

8.3.4 Communications

8.3.4.1 Seek the closest safe harbor and secure barge.

8.3.4.2 Once secured, the Radiation Advisor **(HPT)** shall restrict access surrounding the barge based upon the radiological conditions around the barge.

8.3.4.3 Obtain/repair communication equipment.

8.3.4.4 Once communications are restored, reinitiate transport.

8.3.5 Tie-Down Equipment

8.3.5.1 Communicate with appropriate Bigge/**CYAPCO** personnel to assess the significance of the problem.

8.3.5.2 In the event the tie-down equipment damage jeopardizes the security of the barge, seek the closest safe harbor. Also, attempt to install temporary rigging.

8.3.5.3 Once secured, the Radiation Advisor **(HPT)** shall restrict access surrounding the barge based upon the radiological conditions around the barge.

8.3.5.4 Root cause of the failure shall be determined by Bigge personnel and addressed prior to reinitiating transport.

8.3.5.5 Once rigging has been fixed and/or modified, reinitiate transport.

8.3.6 Tugboat

8.3.6.1 Replace non-functioning tug and await necessary support. If possible, perform necessary repairs.

8.3.6.2 Once repaired and/or replaced reinitiate transport.

8.3.7 Radiation Protection

NOTE: DURING TRANSIT, SURVEYS WILL NOT BE TAKEN. HOWEVER, IF THERE IS CAUSE FOR RADIOLOGICAL CONCERN, A SURVEY SHOULD BE PERFORMED.

8.3.7.1 Identify the source of contamination by performing radiological surveys.

8.3.7.2 If **the Canister** is breached, attempt to isolate it. Restrict access as required to maintain appropriate radiological controls.

8.3.7.3 Based upon discussions with Bigge and **CYAPCO** personnel, either seek shelter or repair the Canister to complete transport.

8.3.7.4 The Radiation Advisor **(HPT)** shall ensure the necessary radiological controls are maintained.

8.3.8 Grounding, Collision, Etc.

8.3.8.1 Request the necessary support equipment and personnel based upon discussions with Bigge and **CYAPCO**.

8.3.8.2 In the event a catastrophic emergency was to occur, Bigge would establish an on-shore Emergency Operations Facility. This Facility shall coordinate the salvage, repair, etc. The responsibility of such actions would be established under Reference **2.21**.

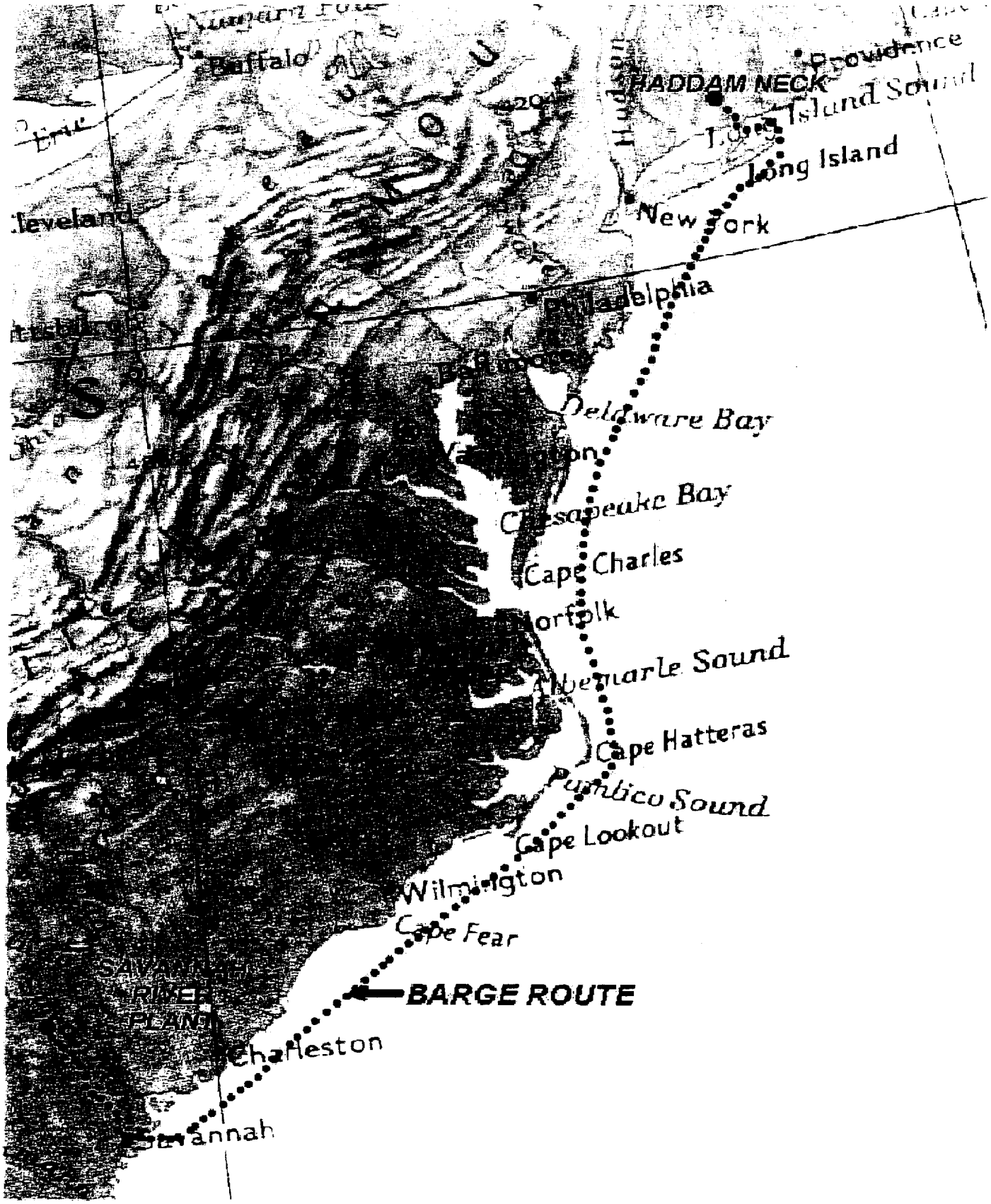
9.0 RECORDS

Quality Assurance records generated as result of this Plan shall be maintained in accordance with References **2.6, 2.10 and 2.11**.

APPENDIX A-1

WATER TRANSPORT

(1 PAGE)

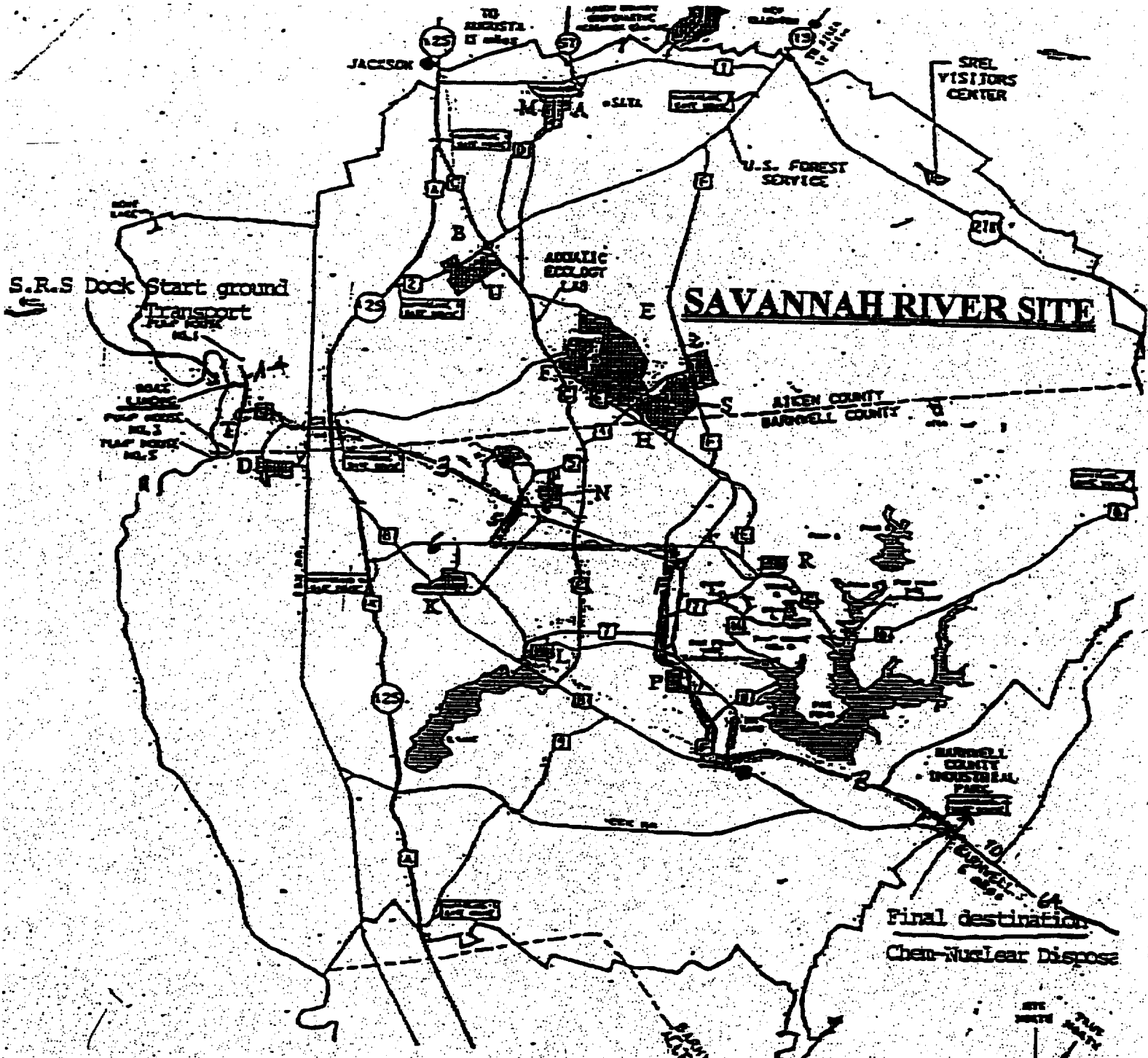

Buffalo
Cleveland
Providence
HADDAM NECK
Long Island Sound
Long Island
New York
Philadelphia
Delaware Bay
Chesapeake Bay
Cape Charles
Norfolk
Albemarle Sound
Cape Hatteras
Pamlico Sound
Cape Lookout
Wilmington
Cape Fear
BARGE ROUTE
Charleston
Savannah

APPENDIX A-2

LAND TRANSPORT

FROM SRS TO BARNWELL

(1 PAGE)



avannah Route Survey So. Carolina 10/13/99

From S.R.S. boat dock
East up paved 18' access road
Right turn onto route A-4.
Left turn at route 3..... cross over State route 125
Right turn at route 5.
Left turn at route 6.
R[illegible]t turn at route F.....11.5 miles from river site
L[illegible] turn at route B .....drive out east gate & enter State Route 64 for apx. 200 feet.
Left turn onto gravel access road to Chem-Nuclear Systems.
Enter disposal site at far right gate.
tal mileage of route: 22.9 miles.

APPENDIX B

EMERGENCY NOTIFICATION INCIDENT FORM

(1 PAGE)

EMERGENCY NOTIFICATION INCIDENT FORM

LOCATION: Latitude:_____ Longitude:_____

PROBLEM: Classification:_____

Description: _____

_____

_____

_____

_____

Action(s) Taken: _____

_____

_____

_____

Notifications: _____

_____

_____

Corrective Actions:
To Be Taken: _____

_____

_____

_____

Radiological
Assessment: _____

_____

_____

_____

Communicator:_____ Date/Time:_____

APPENDIX C

EMERGENCY NOTIFICATION LIST

(1 PAGE)

EMERGENCY NOTIFICATION LIST

1.	**Bigge** **James J. O'Callaghan**	**(510)-638-8100 (Office)** **(510)-918-8901 (Cell)**
2.	**Bigge** **Roger Simpson**	**(510)-638-8100 (Office)** **(510)-918-4608 (Cell)**
3.	Coast Guard	(Radio)
4.	Chem-Nuclear System Security	(803)-259-6069
5.	Connecticut Yankee Power Company Control Room	(860)-267-3211